

Biomedical Engineering

WHAT IS BIOMEDICAL ENGINEERING?

Biomedical engineers develop devices and procedures that solve medical and health-related problems by combining their knowledge of biology and medicine with engineering principles and practices. Many do research, along with life scientists, to develop and evaluate systems and products such as artificial organs, prostheses (artificial devices that replace missing body parts), instrumentation, medical information systems, and health management and care delivery systems. Biomedical engineers may also design devices used in various medical procedures, imaging systems such as magnetic resonance imaging (MRI), and devices for automating insulin injections or controlling body function. Most engineers in this specialty need a sound background in another engineering specialty, such as mechanical or electrical engineering, in addition to specialized biomedical training. Some specialties within biomedical engineering include bioelectronics, biomaterials, biomechanics, biomedical imaging, and biotechnology.*

NEEDED SKILLS:

- Computer, electrical and mechanical engineering background
- Ability to communicate with others
- Scientific problem solving
- Time management
- Mathematical reasoning **

JOB TITLES

- Biomedical Technician
- Bioengineer
- Bio Process Engineer
- Clinical Engineer
- Orthopedic Designer
- Imaging Engineer
- Certified Prothesist **

SALARIES

\$86,220 *

The nationwide average salary for employees with a bachelor's degree in Biomedical Engineering

\$64,686

UM graduates average starting salaries
Courtesy of the Engineering Career Resource Center

**Information from <http://www.bls.gov/ooh/>*

***Information from: <http://www.myplan.com>*

INDUSTRIES AND OCCUPATIONS

- Medical device manufacturing
- Pharmaceutical industry
- Electronic/computer products industry
- Federal Government
- Scientific research
- Business management**

JOB OUTLOOK

Employment of biomedical engineers is expected to grow 23% from 2014 to 2024, much faster than the average for all occupations. However, because it is a small occupation, the fast growth will result in only about 5,100 new jobs over the 10-year period.

Biomedical engineers will likely see more demand for their services because of the breadth of activities they engage in, made possible by the diverse nature of their training.*

MORE INFORMATION

- www.myplan.com
- stats.bls.gov/ooh
- <http://www.bmes.org> (Biomedical Engineering Society)
- <http://www.bme.umich.edu> (UM BME Program website)
- <https://navigate.aimbe.org/>
- Engineering Career Resource Center, 230 Chrysler
- See a BME advisor. Sign up on the EAC website or contact the BME Department at 1111 Gerstacker or 734-763-5290

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WHICH BIOMEDICAL CLASSES SHOULD YOU START WITH?

For BME it is recommended that you take CHEM 210/211 (Organic Chemistry) in your first year. This means that if you place into it your first semester, it is highly recommended that you take it. However, if you place into CHEM 130 your first semester, then you should take CHEM 210/211 in your second semester, and wait to take Physics until the summer or the first term of your sophomore year. In addition to the required organic chemistry course, you should take MSE 250 to begin the major, followed by Biology 172 or 174 and your first BME course, BiomedE 231. If you are ahead on requirements, then you might want to consider BiomedE 211 and BiomedE 221. Read more about the BME Department at: <http://www.bme.umich.edu/>

COURSE DESCRIPTIONS

CHEM 210/211 – 5 credits

Structure and Reactivity/Investigations in Chemistry

See Chemistry website for course descriptions.

MATSCIE 250 – 4 credits

Principles of Engineering Materials

Prerequisites: Chem 130 or Chem 210.

Introductory course to engineering materials. Properties (mechanical, thermal and electrical) of metals, polymers, ceramics and electronic materials. Correlation of these properties with their internal structures (atomic, molecular, crystalline, micro- and macro-), service conditions (mechanical, thermal, chemical, electrical, magnetic, and radiation), and processing.

BIOLOGY 172 or BIOLOGY 174 – 4 credits

Introductory Biology or Intro to Cell and Molecular Biology

See Biology website for course descriptions.

BiomedE 231 – 4 credits

Introduction to Biomechanics ONLY OFFERED WINTER TERM

Prerequisite: Math 116.

This course provides students with an introduction to topics in biomechanics, including statistics, dynamics, and deformable body mechanics, as they apply to biological tissues and systems.

BiomedE 211 – 4 credits

Circuits and Systems for Biomedical Engineering

Prerequisites: Math 214 or Math 216, and Physics 240

Students learn circuits and linear systems concepts necessary for analysis and design of biomedical systems. Theory is motivated by examples from biomedical engineering. Topics covered include electrical circuit fundamentals, operational amplifiers, frequency response, electrical transients, impulse response, transfer functions, and convolution, all motivated by circuit and biomedical examples. Elements of continuous time domain-frequency domain analytical techniques are developed.

BiomedE 221 – 4 credits

Biophysical Chemistry and Thermodynamics

Prerequisites: Chem 130, Math 116, and Chem 210/211.

This course covers the physio-chemical concepts and processes relevant to life. The emphasis lies on the molecular level. Topics: Biomimetics, Energy and Driving Forces, Biochemical Equilibria, Aqueous Solutions, Molecular Self-Assembly, Bio-Electrochemistry, Biopolymers, Molecular Recognition and Binding Equilibria in Biology.